

WHAT IS CLAIMED IS:
Claims

1. Melt-infiltrated fibre-reinforced composite ceramic containing high-temperature-resistant fibres, in particular fibres based on Si/C/B/N, which are reaction-bonded to a matrix based on Si, characterized in that the matrix contains additions of iron, chromium, titanium, molybdenum, nickel or aluminium.
2. Composite ceramic according to Claim 1, characterized in that the matrix contains at least additions of iron.
3. Composite ceramic according to Claim 2, characterized in that the matrix contains additions of chromium, titanium, aluminium, nickel or molybdenum as passive layer formers.
4. Composite ceramic according to Claim 2 or 3, characterized in that the matrix is produced from a silicon alloy containing 0.5-80% by weight of iron.
5. Composite ceramic according to Claim 4, characterized in that the matrix is produced from a silicon alloy containing 5-50% by weight of iron.
6. Composite ceramic according to any of the preceding claims, characterized in that the matrix is produced from a silicon alloy containing from 0.03 to 40% by weight of chromium.
7. Composite ceramic according to any of the preceding claims, characterized in that the matrix is produced from a silicon alloy containing from 1 to 40% by weight of chromium.
8. Composite ceramic according to any of the preceding claims, characterized in that the matrix is produced from a silicon alloy containing from 1 to 10% by weight of chromium.
9. Composite ceramic according to any of the preceding claims, characterized in that the fibres are C fibres of SiC fibres.
10. Composite ceramic according to any of the preceding claims, characterized in that the fibres are collected together to form fibre bundles and are surface-impregnated.

11. Composite ceramic according to Claim 10, characterized in that the fibres are collected together to form short-fibre bundles.

12. Composite ceramic according to Claim 11, characterized in that the fibres comprise C filaments having mean diameters of from about 5 to 12 μm and a length of from about 2 to 10 mm which are collected together to form fibre bundles containing from about 3000 to 14,000 filaments.

13. Process for producing a fibre-reinforced composite ceramic containing high-temperature-resistant fibres, in particular fibres based on Si/C/B/N, which are reaction-bonded to a matrix based on Si, comprising the following steps:

- production of a green body from fibres using binders and fillers by winding, lamination or pressing;
- pyrolysis of the green body under reduced pressure or protective gas in a temperature range from about 800°C to 1200°C to produce a porous shaped body (14);
- infiltration of the porous shaped body (14) with a silicon melt which contains additions of iron, chromium, titanium, molybdenum, nickel or aluminium.

14. Process according to Claim 13, in which the silicon melt contains at least additions of iron.

15. Process according to Claim 14, in which the silicon melt contains additions of chromium, titanium, aluminium, nickel or molybdenum as passive layer formers.

16. Process according to Claim 13 or 14, in which the silicon melt contains 0.5-80% by weight of iron.

17. Process according to Claim 16, in which the silicon melt contains 5-50% by weight of iron.

18. Process according to any of Claims 13 to 17, in which the silicon melt contains from 0.03 to 40% by weight of chromium.

19. Process according to any of Claims 13 to 18, in which the silicon melt contains from 1 to 40% by weight

of chromium.

20. Process according to any of Claims 13 to 19, in which the silicon melt contains from 1 to 10% by weight of chromium.

5 21. Process according to any of Claims 13 to 20, in which the fibres used are C fibres or SiC fibres.

22. Process according to any of Claims 13 to 21, in which the fibres are collected together to form fibre bundles and are surface-impregnated.

10 23. Process according to Claim 22, in which the fibres are collected together to form short-fibre bundles.

24. Process according to Claim 23, in which the fibre bundles used are formed by from about 3000 to 14,000 C filaments having mean diameters of from about 5 to 10 μm and a length of from about 2 to 10 mm.

25. Process according to Claim 23 or 24, in which the green body is produced by dry pressing or hot flow moulding of a granulated material.

20 26. Process according to Claim 25, in which the granulated material is produced by pan granulation.

27. Process according to Claim 26, in which the granulated material is produced continuously or batchwise and has a mean particle size of from about 2 to 6 mm.

25 28. Process according to any of Claims 13 to 27, in which carbon-containing fillers, preferably carbon black or graphite, are added in the production of green body.

29. Process according to any of Claims 13 to 28, in which fillers in the form of silicides are added in the production of the green body.

30 30. Process according to any of Claims 26 to 29, in which a dry mixture of short-fibre bundles and fillers is first premixed and is subsequently mixed with binders in a pelletizing pan (24) to produce the granulated material.

35 31. Process according to Claim 30, in which the granulated material is produced from about 20-60% by weight of SiC powder, about 2-20% by weight of carbon in the form of graphite powder or carbon black, about 10-40%

by weight of C fibre bundles (12K bundles) and about 15-40% by weight of a binder solution, with the latter being sprayed into a pelletizing pan (24).

5 32. Process according to Claim 31, in which the binder solution is an aqueous binder solution containing from 0.01 to 10% by weight of methylcellulose esters and polyvinyl alcohol.

10 33. Process according to any of Claims 26 to 32, in which the granulated material is dried after it has been produced and is subsequently pressed to form the green body.

15 34. Process according to any of Claims 13 to 33, in which the green body is heated to from about 950 to 1050°C under a nitrogen atmosphere in a pyrolysis furnace to produce the porous shaped body.

35. Process according to any of Claims 13 to 34, in which the green body is converted in the pyrolysis into a shaped body having a porosity of from about 30 to 50%.

20 36. Process according to any of Claims 13 to 35, in which the porous shaped body (14) is infiltrated with a silicon melt containing from about 5 to 80% by weight of iron with the balance being silicon.

25 37. Process according to any of Claims 13 to 36, in which the porous shaped body (14) is infiltrated with a silicon melt containing from about 10 to 50% by weight of iron, from 1 to 10% by weight of chromium and silicon as the balance.

Add A2